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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/781,314	02/17/2004	Youzhi E. Xu	42390P13563D	4855

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EXAMINER

FISCHER, JUSTIN R

ART UNIT	PAPER NUMBER
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1791

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03/06/2008

PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No. 10/781,314	Applicant(s) XU, YOUZHI E.	
	Examiner Justin R. Fischer	Art Unit 1791	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 29 November 2007.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 16-22 and 24-31 is/are pending in the application.
- 4a) Of the above claim(s) 31 is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 16-22 and 24-30 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. _____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|--|---|
| 1) <input type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413) |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | Paper No(s)/Mail Date. _____ |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08) | 5) <input type="checkbox"/> Notice of Informal Patent Application |
| Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

Election/Restrictions

1. Newly submitted claim 31 is directed to an invention that is independent or distinct from the invention originally claimed for the following reasons:

This application contains claims directed to the following patentably distinct species- (a) electrodeposition of a polymer or oligomer and (b) electropolymerization of a monomer see Paragraph 20 of original disclosure). The species are independent or distinct because claims to the different species recite the mutually exclusive characteristics of such species. In addition, these species are not obvious variants of each other based on the current record.

Applicant is required under 35 U.S.C. 121 to elect a single disclosed species for prosecution on the merits to which the claims shall be restricted if no generic claim is finally held to be allowable. Currently, there are no generic claims.

There is an examination and search burden for these patentably distinct species due to their mutually exclusive characteristics. The species require a different field of search (e.g., searching different classes/subclasses or electronic resources, or employing different search queries); and/or the prior art applicable to one species would not likely be applicable to another species; and/or the species are likely to raise different non-prior art issues under 35 U.S.C. 101 and/or 35 U.S.C. 112, first paragraph.

Applicant is advised that the reply to this requirement to be complete must include (i) an election of a species to be examined even though the requirement may be traversed (37 CFR 1.143) **and (ii) identification of the claims encompassing**

the elected species, including any claims subsequently added. An argument that a claim is allowable or that all claims are generic is considered nonresponsive unless accompanied by an election.

The election of the species may be made with or without traverse. To preserve a right to petition, the election must be made with traverse. If the reply does not distinctly and specifically point out supposed errors in the election of species requirement, the election shall be treated as an election without traverse. Traversal must be presented at the time of election in order to be considered timely. Failure to timely traverse the requirement will result in the loss of right to petition under 37 CFR 1.144. If claims are added after the election, applicant must indicate which of these claims are readable on the elected species.

Should applicant traverse on the ground that the species are not patentably distinct, applicant should submit evidence or identify such evidence now of record showing the species to be obvious variants or clearly admit on the record that this is the case. In either instance, if the examiner finds one of the species unpatentable over the prior art, the evidence or admission may be used in a rejection under 35 U.S.C. 103(a) of the other species.

Upon the allowance of a generic claim, applicant will be entitled to consideration of claims to additional species which depend from or otherwise require all the limitations of an allowable generic claim as provided by 37 CFR 1.141.

Since applicant has received an action on the merits for the originally presented invention, this invention has been constructively elected by original

presentation for prosecution on the merits. Accordingly, claim 31 is withdrawn from consideration as being directed to a non-elected invention. See 37 CFR 1.142(b) and MPEP § 821.03.

Claim Rejections - 35 USC § 103

2. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

3. Claims 16, 17, 19, 20, 22, 24-28, and 30 rejected under 35 U.S.C. 103(a) as being unpatentable over Matayabas (US 2003/0128521, of record) and further in view of Pelrine (US 6,809,462, of record) and Pelrine (US 6,707,236, of record). The references are applied in the same manner as set forth in the Non Final Rejection mailed on August 27, 2007.

As best depicted in Figure 1, Matayabas is directed to an apparatus/system comprising a printed circuit board, an integrated circuit chip 2 (heat generating device), an integrated heat spreader 6 (heat dissipating device), and a first thermal interface material 7 disposed between said integrated circuit chip and said integrated heat spreader (Paragraph 20). The reference further suggests that the thermal interface material can comprise a polymer matrix and a thermally conductive filler (Paragraph 21). In this instance, it appears that a covalent bond would necessarily result between the thermally conductive filler and both the integrated heat spreader and the integrated circuit chip. It is further noted that Figure 1 in the original disclosure depicts these

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bonds 124, 126 and there does not appear to be any unique processing that results in the occurrence of said bonds (disclosure in Paragraph 18 is related to the covalent bonds between the filler and the matrix, not the filler and the chip or spreader).

As to the thermal interface material, Matayabas suggests a wide variety of materials, including silicones and polyurethanes (Paragraph 22). While not expressly disclosed as such, several of the disclosed materials are recognized as being electroactive polymers, as shown for example by Pelrine '462 (Column 16, Lines 20-33) and Pelrine '236 (Column 4, Lines 24-43). Thus, one of ordinary skill in the art at the time of the invention would have found it obvious to form the thermal interface material from an electroactive polymer. Lastly, the particular method in which the electroactive polymer is applied is related to the manufacturing method and does not further define the structure of the claimed apparatus/system.

With respect to claim 19, the thermal interface material of Matayabas (matrix and filler) is seen to constitute a molecular composite material.

As to claim 20, Matayabas suggests a thermal interface material comprising thermally conductive fillers. In describing the fillers, Matayabas suggests the use of a wide variety of filler average particle sizes and distributions (Paragraph 31). It is additionally noted that the reference suggests the exemplary use of fillers having an average particle size less than 30 microns. It appears that such an arrangement is analogous to the claimed "nanocomposite" requirement as there is no quantitative distinction provided in the original disclosure. Furthermore, it is evident that Matayabas is directed to a wide variety of constructions in which extremely small filler materials are

included in the thermal interface material. Absent any conclusive showing of unexpected results, one of ordinary skill in the art at the time of the invention would have found it obvious to form said material with a nanocomposite material.

With respect to claims 22 and 28, as detailed above, the apparatus/system of Matayabas includes a thermal interface material comprising a polymer matrix and a thermally conductive filler, wherein said filler would be covalently bonded to the integrated circuit package and the integrated heat spreader. The reference further suggests that the "example embodiment" has a thermal conductivity of 3.4 W/mK (Paragraph 30). It is noted, however, that the reference further teaches one of ordinary skill in the art at the time of the invention would have been able to appropriately select the filler selection and weight percent as such parameters are recognized as affecting the properties (conductivity) of the thermal interface material. A fair reading of Matayabas suggests the use of thermal interface materials having a wide variety of conductivities, including those above 4 W/mK. One of ordinary skill in the art at the time of the invention would have been able to appropriately determine the desired conductivity as a function of the specific system/apparatus, there being no showing of unexpected results to establish a criticality for the claimed conductivity.

Regarding claim 24, as noted above, the heat dissipating device is an integrated heat spreader.

As to claim 25, the apparatus/system of Matayabas includes a heat sink 8.

With respect to claim 26, the apparatus/system of Matayabas includes a second thermal interface material 9 between said spreader and said heat sink. In a similar

manner to the first thermal interface material, one of ordinary skill in the art at the time of the invention would expect a covalent bond between the thermally conductive filler of the second thermal interface material and the heat spreader or heat sink.

Regarding claim 30, Matayabas discloses an apparatus/system wherein the integrated circuit package is a C4 package (Figure 1).

4. Claims 18, 21, 29 are rejected under 35 U.S.C. 103(a) as being unpatentable over Matayabas, Pelrine '462, and Pelrine '236 as applied in claim 16 above and further in view of Takeuchi (US 2003/0122242, of record). The references are applied in the same manner as set forth in the Non Final Rejection mailed on August 27, 2007.

As detailed above, Matayabas substantially teaches the apparatus/system of the claimed invention, including the use of a first and second thermal interface material between respective components. In describing the thermal interface material, Matayabas suggests the exemplary use of a silicone-based gel; however, the reference further suggests that additional polymer matrices are within the scope of the reference, such as those based on polyurethanes, polyureas, anhydride-containing polymers, and the like. One of ordinary skill in the art at the time of the invention would have recognized this language as including any polymer matrix that is suitable for use in a thermal interface material, including epoxy (described as thermal epoxy), as shown for example by Takeuchi (Paragraph 20). In this instance, Takeuchi recognizes the use of a wide variety of material, including epoxies, for the polymer matrix. Absent any conclusive showing of unexpected results, one of ordinary skill in the art at the time of

the invention would have found it obvious to use any of the well known materials, such as epoxy, used to form polymer matrices in thermal interface materials.

Response to Arguments

5. Applicant's arguments filed November 29, 2007 have been fully considered but they are not persuasive.

Applicant argues that one of ordinary skill would not combine the electronic package having a thermal interface material of Matayabas with the electroactive polymer sensors of Pelrine since the electroactive polymers of Pelrine are not used as a thermal interface material. The rejection, however, does not involve using the specific polymers of Pelrine in the apparatus/system of Matayabas. As set forth above, Matayabas discloses a thermal interface material comprising a polymer matrix and a thermally conductive filler, wherein said matrix can be, for example, a silicone or a polyurethane. Pelrine (e.g. '462) has been provided to recognize such polymers as being "electroactive polymers". It is emphasized that Pelrine is provided to expressly recognize a characteristic of the existing thermal interface material of Matayabas. It is also noted that Pelrine suggests that conductive polymers can be considered a species of the genus "electroactive polymers" (Column 16, Lines 47-57). Thus, it is clearly evident that the thermal interface material of Matayabas, which comprises a matrix and a thermally conductive filler, can be viewed as an electroactive composition. Lastly, the language "electroactive" polymer does not define over the thermal interface material of Matayabas since any polymer would have some response to an electrical stimulation.

In regards to the method in which the thermal interface material is applied, applicant argues that electrodeposition produces physical bonding superior to traditional methods of adhesion, further reducing contact thermal resistance. In this instance, though, applicant's attempt to evidence the manufacture of a materially different product is not persuasive. In particular, it is unclear if the degree of adhesion between the respective components is significantly greater as to form a materially different product (characterization of "superior" adhesion does not indicate the degree to which the respective assemblies differ). As such, the method limitations do not further define the structure of the claimed system.

Conclusion

6. **THIS ACTION IS MADE FINAL.** Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire **THREE MONTHS** from the mailing date of this action. In the event a first reply is filed within **TWO MONTHS** of the mailing date of this final action and the advisory action is not mailed until after the end of the **THREE-MONTH** shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than **SIX MONTHS** from the mailing date of this final action.

7. Any inquiry concerning this communication or earlier communications from the examiner should be directed to **Justin R. Fischer** whose telephone number is **(571) 272-1215**. The examiner can normally be reached on M-F (7:30-4:00).

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Richard Crispino can be reached on (571) 272-1226. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

Justin Fischer
/Justin R Fischer/
Primary Examiner, Art Unit 1791